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About an accuracy of ECal/MPD calibration with cosmic muons

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M.Bhattacharjee^{1,3}, S.A.Bulychjov², Yu.F.Krechetov¹, V.V. Kulikov², M.A. Martemianov², M.A. Matsyuk², I.A. Tyapkin¹ 1 Joint Institute for Nuclear Research, 141980, Dubna, Russia 2 National Research Center “Kurchatov Institute”, Moscow, 123182 Russia 3 Gauhati University, Guwahati, Assam 781014, India In a framework of the NICA/MPD project [1], a cylindrical electromagnetic calorimeter (ECal) [2] with an internal(external) diameter of 3.45 (4.6) m , a length of 6 m and a total weight of about 60 tons is under construction. The calorimeter consists of 38,400 “shashlik”-type towers with 210 alternating layers of a 1.5 mm scintillator and 0.3 mm lead coated with reflective paint. The shapes of the towers are of 64 types. Approximately they are truncated pyramids with a base of 4x4 cm², height of 41 cm and vertex angles of 0.9 and 1.2 degrees in the longitudinal and transverse plane relative to the cylinder axis. ECal implements the so-called projective geometry when the axes of all towers look at one point - the intersection point of the collider beams located in the center of the cylinder. Every 16 towers are combined into 2400 modules of 8 types. Large number of modules have been already produced [3] and tested on electron beams and cosmic rays [4,5]. In this report we discuss the energy calibration procedure with cosmic muons with the main emphasis on its accuracy and corrections needed for different types of the towers and their orientation in space. The results are based on MC simulation and comparison with the existing measurements. [1] The MPD Collaboration: V. Abgaryan et al. «Status and initial physics performance studies of the MPD experiment at NICA. Eur.Phys.J.A 58 (2022) 7, 140. [2] V.V. Kulikov et al. ECal MPD: geometry and simulation. 2020 JINST 15 C09017. [3] Y. Li et al. Production and quality control of NICA-MPD shashlik electromagnetic calorimeter in Tsinghua University. JINST 17 (2022) 04, T04005. [4] V.A. Baskov et al. Electron Beam Test of the MPD Electromagnetic Calorimeter on the Pakhra Synchrotron. Phys.Part.Nucl. 52 (2021) 4, 663. [5] M. Bhattacharjee et al. Calibration of NICA-MPD electromagnetic calorimeter modules with cosmic muons. 2020 J. Phys.: Conf. Ser. 1690 012052.

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